REMARKS/ARGUMENTS

Status of Claims; Election/Restriction Requirements

Claims 1-44 are pending in this application. The claims were made subject to a revised Restriction Requirement, which was discussed with the Examiner on February 6, 2006. In the new Restriction, Group I (claims 1-27 and 40) is drawn to slurry coating compositions; Group II (claims 28-39) is drawn to a method of aluminiding a metal substrate; and Group III (claims 41-44) is drawn to a metal surface with a slurry coating thereon. Applicant affirms the selection of the invention of Group II, but continues to maintain that all of the claims should be considered to be part of a single inventive concept. For example, Applicant submits that the procedural mechanism for dividing Groups I and II is not supported by a practical illustration. While it might be possible to employ the claimed composition to aluminize a polymeric or ceramic substrate, that is not a realistic end use for the composition. Applicant's process relies on diffusion of aluminum from the composition into a region of a metal substrate. It does not appear likely that anything analogous to that diffusion would take place on a polymeric substrate, for example. However, if the Examiner can offer a documented example of such an occurrence, Applicant would re-evaluate this stance.

Applicant agrees that there is an appropriate rationale for a division between Groups II and III. However, it appears that the claims in those groups can still be searched by way of a single effort – especially in view of the cross-reference of classes and subclasses, as well as improved computer-searching capabilities. In view of the fact that restriction between these groups is not actually mandated, the undersigned requests reconsideration regarding this portion of the Restriction Requirement.

Moreover, Applicant disagrees with the rationale for restriction between Groups I and III. It is respectfully submitted that the two groups of claims are not related as a legitimate "intermediate-final product relationship". The first set of claims is directed to a composition, while Group III is directed to a substrate covered with the composition. This is quite different, for example, from some sort of chemical intermediate which is formed from starting materials, and is then transformed into an end product. Moreover, as noted above, Applicant is doubtful about the illustration regarding use of the claimed diffusion material for a plastic or ceramic substrate.

Applicant appreciates the Examiner's detailed response and explanation (pages 4-5 of the Office Action), regarding the arguments for the first Restriction Requirement. Further comment is made here, only because it relates to the present issues as well. The undersigned agrees that different search paths are sometimes necessary when searching related inventions on both compositions and methods-of-coating. However, in the present instance, the composition is a very prominent feature of both sets of claims, and therefore, a search of the "total" subject matter should not involve a significant period of time greater than a search on only one of the specific claim types.

Thus, Applicant again requests that one or more of the inventive groups be merged. While the following remarks will generally focus on the active claims, they may also be relevant to some or all of the claims which have been withdrawn. Moreover, Applicant acknowledges the obligation of amending inventorship, if warranted by a change in the identity of the active claims.

Rejections Under 35 U.S.C. 102

Claims 28-29 and 33-36 have been rejected under 35 U.S.C. 102(b), as being anticipated by McMordie et al, U.S. Patent 5,650,235 ("McMordie"). It appears to be the Examiner's position that the reference describes a method which includes all of the limitations of the rejected claims. Applicant respectfully disagrees with the Examiner in this regard, as outlined below.

A brief explanation of some aspects of the present invention might be appropriate at this time. Primary embodiments relate to a method for aluminiding the surface region of a metal substrate. A slurry layer comprising colloidal silica and particles of an aluminum-based powder is applied to the substrate, followed by a heat treatment which removes any volatile components, and causes diffusion of aluminum into the surface region.

Specific limitations in the pending claims are key to certain aspects of this invention. For example, the slurry composition must be free of hexavalent chromium. As explained in the specification, e.g., paragraphs 10-13, chromium compounds can often be very useful in protecting a metal substrate against oxidation and corrosion, especially at high temperatures. However, elimination of the chromium compounds (particularly hexavalent chromium) from the compositions is sometimes very desirable, e.g., for health and safety reasons. While chromate-free compositions which may perform adequately have been developed in the art, they often exhibit considerable disadvantages. For example, the coatings may exhibit a high level of instability, and can also generate unacceptable levels of gasses such as hydrogen.

McMordie describes a method of providing a coating on a nickel-based alloy substrate, to enhance its oxidation and corrosion resistance. The substrate is first enriched with platinum by depositing a layer of the metal on the

surface of the substrate, and then heating the surface to diffuse the platinum into the substrate. Aluminum and silicon are then simultaneously diffused from a molten state into the platinum-enriched substrate (col. 4, lines 55-64). In one embodiment, a slurry which includes aluminum powder and silicon is diffused into the substrate at a temperature above 660°C, so that the aluminum powder melts and dissolves the silicon (col. 6, lines 16-25). A number of examples are provided, describing the preparation of coating compositions, along with the testing of coated substrates for hot corrosion resistance and the like. In one example, water is combined with colloidal silica, colloidal alumina, aluminum powder, and silicon powder (Example 5). In some cases, an aluminum-silicon eutectic alloy powder may be used, as noted in column 8, lines 22-27.

McMordie describes compositions which have some ingredients similar to those of the pending claims. However, the reference fails to disclose slurry compositions which must be substantially free of hexavalent chromium, as in the present invention. Certain compositions in the patent which happen to omit mention of chromium do not satisfy this key limitation. Chromium is certainly a constituent in some embodiments of McMordie, at a substantial level of up to about 20% (see col. 7, lines 57-62; and Example 1).

There are other distinctions as well. McMordie always requires a platinum diffusion step. While platinum diffusion into the substrate is not outside the scope of the present invention, the fact that it is required by the reference is another indication that two different types of inventions are being considered here. Moreover, the present invention requires the use of colloidal silica, while McMordie only mentions the material once, in reference to one exemplary coating composition. For these reasons, Applicant submits that McMordie does not anticipate the claims at issue.

Rejections Under 35 U.S.C. 103

Claim 37 has been rejected under 35 U.S.C. 103, as being unpatentable over McMordie, discussed above. The claim is directed to an aluminum diffusion region of about 200 microns within the substrate. It is the Examiner's position that while McMordie is silent as to a surface region depth, it would have been obvious to have determined the optimum depth through experimentation.

Applicant disagrees with the Examiner, since the reference does not suggest reasons or any motivation for selecting a particular diffusion depth. The aluminum-diffused surface region for the present invention is an area especially susceptible to aluminum migration, e.g., into an overlying protective coating. (See paragraphs 5-7 and 56 of the specification). While McMordie provides a general description of the desirability of diffusing platinum, silicon, and nickel into the substrate, the reference shows no recognition of the motivation to determine a specific region of aluminum diffusion.

Claims 30-32 and 38-39 have been rejected under 35 U.S. 103, as being unpatentable over McMordie, as applied previously, and further in view of Bladi, U.S. Patent 5,102,700. The Examiner's position appears to be that it would have been obvious to have added binder/stabilizer-type compounds described in Baldi to the slurry composition of McMordie. Applicant submits that the "combinability" of the references is not justified in this situation. Even if they could be combined, the result does not support a rejection of these claims.

Baldi describes an aluminide-forming coating composition applied to a metal substrate from a suspension of aluminum-containing powder. The aluminide can be formed by reaction between aluminum powder and another aluminide precursor. The suspension can also include polyvinylalcohol, to

improve binder characteristics (col. 3, lines 11-17). It appears that the coating composition can be applied to substrates such as steel or nickel.

In general, Baldi has very little to do with the present invention. Certainly, the reference describes some sort of aluminum-containing composition being applied to a metal substrate. However, Baldi fails to describe a single composition which includes both colloidal silica and aluminum-based powder. (The reference mentions some form of silica being used, e.g., as a separate coating for a radiating surface (col. 19, lines 39-43 and lines 61-63); as some type of suspension system for a resin coating (col. 20, lines 47-50); and as a type of fiber mat (col. 3, lines 48-50). However, none of these uses appear to be related to the slurry of the present invention). It also appears that embodiments of the reference teach against the use of a aluminum-silicon constituent (col. 1, lines 38-40). Moreover, the use of chromium constituents is clearly described (col. 4, line 64 to col. 5, line 3).

Baldi describes the use of aluminum-containing materials as a coating for nickel superalloys (col. 4, lines 44-54). However, the primary end use described in the reference has no relation to the present invention. The primary end use relates to the deposition of pyrophoric aluminide particles or strips onto some sort of a release-substrate. It seems that the aluminide material is then released as part of a decoy shell used against heat-seeking missiles. (See Abstract; col. 8, lines 51-58; col. 7, lines 11-13; col. 3, 26-31).

In view of these distinctions, Applicant submits that a combination of Baldi and McMordie cannot be maintained, as applied to the pending claims. Neither reference describes the use of Applicant's claimed slurry, to form an aluminum-diffusion region for the specific purpose contemplated by Applicant, as described previously. Moreover, neither reference describes a slurry which specifically excludes the use of hexavalent chromium.

Furthermore, Applicant emphasizes that Baldi never suggests embodiments covered by claims 30 and 31. To review briefly, some preferred embodiments of the present invention require the presence of an organic stabilizer, e.g., compounds with at least two, and preferably three, hydroxy groups. As described in paragraphs 39 and 40 of the specification, the stabilizer functions to chemically-stabilize the aluminum or aluminum-silicon component of the slurry. As described elsewhere (e.g., paragraphs 16, 62, 82 and 86), stabilization of the slurry in these embodiments is critical for the practical use of the slurry – especially when the slurry must be free of chromate-type additives.

Neither McMordie nor Baldi ever suggest the use of slurry compositions like those of the present invention, in which specific types of organic compounds are employed as shelf-life stabilizers. While Baldi may mention the presence of polyvinylalcohol (Examiner's reference to col. 3), the purpose of the alcohol does not appear to relate to chemical stability, but only to binder properties. The "binding" appears to relate to maintaining the coating powder in place on the substrate (col. 2, lines 21-25), and has nothing to do with slurry stability, as in the present invention. Thus, Applicant submits that claims 30 and 31, as well as the other claims rejected by according to the McMordie-Baldi theory, should be allowed.

Claims 28-29 and 33-37 are rejected under 35 U.S. 103, as being unpatentable over Mor et al, U.S. Patent 6,428,630 ("Mor"). In brief, it appears to be the Examiner's position that Mor describes Applicant's process, including the selection of a particular aluminum particle size. Applicant respectfully submits that Mor fails to disclose Applicant's composition, while also being different enough to clearly prevent a rejection under an obviousness theory.

Mor describes a coating process. A metallic layer is first applied to the substrate by a thermal spray technique like HVOF. A slurry layer is then deposited over the metallic layer. The slurry contains one or more aluminum pigments, and one or more inorganic liquid binders, and can be chromate-free. (Column 5, lines 23-33; column 9, lines 35-40). The aluminum in the slurry layer can be diffused to form an intermetallic layer of nickel aluminide (col. 9, lines 16-21; col. 10, lines 10-16).

Applicant first notes that Mor is not depositing a slurry coating onto a metal substrate, as in the present invention. Instead, the patent is specifically directed to a two-step process, in which a metallic coating is first applied over the substrate, and then a slurry coating is applied over the metallic coating. The Examiner appears to be equating "substrate" with the "coating" applied over Mor's true substrate, which is properly designated as such in the patent. Those skilled in the art would not associate Mor's coating with a substrate, since the latter clearly relates to some sort of object in this context, e.g., the turbine engine part of pending claim 39. (It should also be noted that Mor's coating can be formed of only 8% nickel (col. 5, lines 25-27), and this would never suggest a nickel-based superalloy substrate to one skilled in the art).

Furthermore, Mor has nothing to do with the specific purpose of the present invention. Diffusion is carried out by the present inventors to counter the loss of aluminum from a superalloy substrate (e.g., see paragraphs 5 and 6). Mor's process is specifically directed to an innovation in spray deposition, wherein a thermally-sprayed intermediate coating is modified (e.g., via diffusion), by the subsequent deposition of a slurry coating. Conventional NiAl intermetallic layers on top of a substrate are the desired result .

Thus, Applicant emphatically submits that Mor is an insufficient reference for rejecting the pending claims. The Examiner matches up the

teachings of Mor to the elements of a number of the present claims (Office Action, bottom of page 8, continuing to page 9). However, any similarity between the teachings of Mor and those claim elements does not overcome the basic differences set forth above.

Claims 30-32 and 38-39 are rejected under 35 U.S. 103, as being unpatentable over Mor et al, as applied previously, and further in view of Baldi, also described above. Many of the points brought up in this rejection are similar to other points in the Office Action.

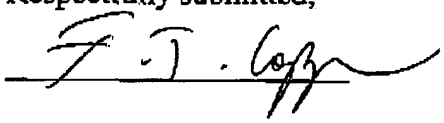
In general, the undersigned again emphasizes that each of these references lacks critical elements present in the pending claims. An attempt to combine the two references – even if warranted – does not supply those missing elements - literally or by implication. As an example, Mor fails to teach the use of an organic stabilizer in Applicant's claimed process, but so does Baldi. Moreover, Baldi fails to describe the deposition of a slurry coating like Applicant's onto a superalloy substrate, but so does Mor.

Finally, the Examiner refers to a statement in Mor (column 6, lines 17-23), that appears to extend the patentee's invention to any applicable "surface". Applicant has reviewed the language, and submits that the teaching and extrapolation of the Mor invention is still restricted to the modification of coatings, not substrates. Mor's process always involves the thermal-spraying of a coating, followed by the diffusion of another material into that coating. Typical substrates, like superalloy components, are not formed by a thermal spray process, and would not be consistent with Mor's process. Certainly, the referenced statement might serve to broaden the Mor process to different types of coatings, coating systems, or top layers, but not to anything like Applicant's invention.

Conclusion

Applicant respectfully submits that all of the pending claims are now in allowable condition. Should the Examiner believe that anything further is needed to eliminate any remaining issues, the undersigned would welcome a call from the Examiner. The contact information is provided below.

Respectfully submitted,



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